Misc: 420-2

FABRICATED METAL STAY-IN-PLACE FORMS (5-10-99)

1.0 DESCRIPTION

The work covered by this Special Provision consists of furnishing all materials, labor, equipment and incidentals necessary for the proper installation of fabricated metal stay-in-place forms for concrete bridge deck slabs. The stay-in-place forms shall be used to form the concrete deck slabs as shown on the contract drawings and shall have closed tapered ends.

420-3(D) & 420-3(D)2

2.0 MATERIALS

1074-12

Metal stay-in-place forms for concrete floor slabs shall be of zinc-coated (galvanized) steel sheet conforming to ASTM Specification A653 (Structural Steel (SS) Grade 33 through 80) with coating class of G165 and shall otherwise meet all requirements relevant to steel stay-in-place forms and the placing of concrete as specified herein and as noted on the contract drawings.

3.0 DESIGN

The following criteria shall govern the design of steel stay-in-place forms:

420-3(D)2

- The metal forms shall be designed on the basis of dead load of the form, reinforcement and the plastic concrete, including the additional weight of concrete due to the deflection of the metal forms, plus 50 lbs/ft^2 for construction loads. The unit working stress in the steel sheet shall not be more than 0.725 of the specified minimum yield strength of the material furnished but shall not exceed 36,000 psi. Material thickness thinner than 20 gage shall not be used.
- The horizontal leg of the support angle shall not be greater than 3 inches. The support angle shall be designed as a cantilever.
- Deflection under the weight of the forms, the plastic concrete and reinforcement shall not exceed 1/180 of the form span or 1/2 inch whichever is less, but in no case shall this loading be less than 120 lbs/ft^2 total.
- The permissible form camber shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in excess of the foregoing limits.
- The design span of the form sheets shall be the clear distance between edges of beam or girder flanges minus 2 inches measured parallel to the form flutes. The length of the form sheets shall not be less than the design span of the forms.
- Physical design properties shall be computed in accordance with requirements of American Iron and Steel Institute “Specification for the Design of Cold-Formed Steel Structural Members” latest published edition.
- All bottom mat reinforcement shall have a minimum concrete cover of 1¼ inches clear above metal stay-in-place form.

1074-12

420-3(D)2

- The plan dimensions of both layers of primary deck reinforcement from the top of the concrete deck shall be maintained.
- Welding shall not be permitted to flanges in tension or to structural steel bridge elements fabricated from non-weldable grades of steel.

4.0 UNLOADING AND HANDLING OF MATERIALS

All fabricated metal stay-in-place forming materials shall not be unloaded or handled in such a manner as to damage or alter the configuration of the forms. Damaged materials shall be replaced at no additional cost to the Department of Transportation.

5.0 STORAGE OF MATERIALS

All fabricated metal stay-in-place forms which are stored at the project site shall be stored at least 4 inches above the ground on platforms, skids or other suitable supports and shall be protected against corrosion and damage from any source.

6.0 CONSTRUCTION

420-3(D)2

All forms shall be installed in accordance with detailed fabrication plans submitted to the Engineer for review. The fabrication plans shall clearly indicate locations where the forms are supported by steel beam flanges subject to tensile stresses. Within these locations, no welding to the flanges will be allowed.

Form sheets shall not be permitted to rest directly on the top of the beam or girder. Sheets shall be securely fastened to form supports and shall have a minimum bearing length of 1 inch at each end. Sheets shall be centered between the form supports. Form supports shall be placed in direct contact with the flange of girder or beam. All attachments shall be made by permissible welds, bolts, clips or other approved means. However, welding of form supports to flanges of steels not considered weldable and to those portions of a flange subject to tensile stresses shall not be permitted. All welding shall be in accordance with Article 1072-20 of the Standard Specifications, except 1/8" fillet welds will be permitted.

In the areas where the form sheets lap, the form sheets shall be securely fastened to one another by screws at a maximum spacing of 18 inches. The ends of the form sheets shall be securely attached to the support angles with screws at a maximum spacing of 18 inches.

Any exposed form metal where the galvanized coating has been damaged shall be thoroughly cleaned, wire brushed, then painted with two coats of zinc oxide zinc dust primer, Federal Specification TT-P-64ld, Type II, no color added, to the satisfaction of the Engineer. Minor heat discoloration in areas of welds need not be touched up.

Transverse construction joints shall be located at the bottom of a flute and 1/4 inch weep holes shall be field drilled at not more than 12 inches on center along the line of the joint.

All cuts shall be made by a saw. No flame cutting will be permitted.

7.0 PLACING OF CONCRETE

420-15(A)

Concrete shall be placed in accordance with the contract specifications. Particular emphasis shall be placed on proper vibrations of the concrete to avoid honeycomb and voids, especially at construction joints, expansion joints, and valleys and ends of form sheets. Pouring sequences, procedures and mixes shall be approved by the Engineer.

Concrete shall not be placed on the forms to a depth greater than 12 inches above the top of the forms. Concrete shall not be dropped more than 3 feet above the top of the forms, beams or girders and the concrete shall be discharged directly over the beams or girders.

8.0 REMOVAL OF FALSEWORK ON BENT DIAPHRAGMS FOR PRESTRESSED CONCRETE GIRDER SPANS

420-17

Falsework supports underneath bent diaphragms shall remain in place until after deck concrete has been cast and has reached a minimum compressive strength of 2400 psi in accordance with Article 420-17 of the Standard Specifications. If the Contractor wishes to remove form supports under bent diaphragms prior to casting deck concrete, he must submit to the Engineer for approval his proposed method of preventing the possibility of bent diaphragms from slipping downward.

9.0 INSPECTION

The Contractor's method of construction shall be carefully observed by the Engineer during all phases of the construction of the bridge deck slab. These phases include installation of the metal forms; location and fastening of the reinforcement; composition of concrete items; mixing procedures, concrete placement and vibrations; and finishing of the bridge deck.

420-15(C)

After the deck concrete has been in place for a minimum period of 2 days, the concrete shall be tested for soundness and bonding of the forms by sounding with a hammer as directed by the Engineer. A minimum of 50% of the individual form panels, selected at random by the Engineer, shall be hammer tested over the entire area of the panel. If areas of doubtful soundness are disclosed by this procedure, the Contractor will be required to remove the forms from such areas for visual inspection after the pour has attained a minimum compressive strength of 2400 psi. This removal of the stay-in-place forms shall be at no additional cost to the Department of Transportation.

At locations where sections of the forms are removed, the Contractor will not be required to replace the forms, but the adjacent metal forms and supports shall be repaired to present a neat appearance and assure their satisfactory retention. As soon as the forms are removed, the concrete surfaces will be examined for cavities, honeycombing and other defects. If irregularities are found, and in the opinion of the Engineer these irregularities do not justify rejection of the work, the concrete shall be repaired as the Engineer may direct. If the concrete where the forms are removed is unsatisfactory, additional forms, as necessary, shall be removed to inspect and repair the slab, and the Contractor's methods of

420-15(C)

construction shall be modified as required to obtain satisfactory concrete in the slabs. All unsatisfactory concrete shall be removed or repaired as directed by the Engineer.

The Contractor shall provide all facilities as are reasonably required for the safe and convenient conduct of the Engineer's inspection procedures.

10.0 FABRICATION AND ERECTION DRAWINGS

420-3(D)2

The Contractor shall submit eight copies of complete fabrication and erection drawings to the Engineer for review, comments and acceptance. ~~All drawings shall be thoroughly checked in all respects by the Contractor. Acceptance of the drawings by the Engineer shall not relieve the Contractor of his responsibility for the correctness of his drawings, or for the fit of all shop and field connections.~~ These plans shall indicate the grade of steel, the physical and section properties for all permanent steel bridge deck form sheets and a clear indication of locations where the forms are supported. The forming material shall not be fabricated until drawings have been accepted.

420-3(D)2

11.0 BASIS OF PAYMENT

~~No separate payment will be made for fabricated metal stay-in-place forms, but the entire cost of furnishing and installing these forms in accordance with this Special Provision shall be included in the contract unit price bid per square foot for "Reinforced Concrete Deck Slab".~~

Is Paid For Under New Pay Item for "Reinforced Concrete Deck Slab" in 420-21(E) & 420-22